

UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
BERKELEY, CALIFORNIA

THE HOME APIARY

J. E. ECKERT¹

The purpose of this leaflet is to call attention to some facts that are fundamental to success in keeping bees, with the information designed primarily for the small beekeeper. At the same time the experienced apiarist is urged to reconsider all fundamentals of beekeeping in order to make his colonies more efficient.

Relation of Bees to Agricultural Production

The honeybee is an essential factor in the production of seeds for our increased pastures for livestock, and for victory gardens as well as commercial plantings of vegetables. Bees increase the actual production of most fruit and vegetable crops by effecting proper pollination of the blossoms. Beeswax is an essential material used in war industries, and honey production adds to our total supply of energy-producing foods. For these reasons an increase in the total number of colonies of bees as well as in the production therefrom is now being urged by governmental agencies.

First Considerations

The first requirement is for the prospective beekeeper to determine his reaction to bee stings. Those who are seriously affected by the poison of bees had better not engage in beekeeping. One can become immune to the swelling that follows the sting of a bee by gradually acquiring additional stings over a period of several weeks.

Bees may be kept any place where they can secure sufficient pollen and nectar for the colony's needs throughout the year, and produce a surplus of honey for their keeper. Hives should be located where they receive at least partial shade during the heat of summer, and where the flight of bees will not interfere with the neighbors. They should not be located near highways, or where the passerby or gardener is likely to come into the flight of the bees, or near feed lots, horse corrals, or where animals are worked or watered.

Bees should be kept only in movable-frame equipment so that the combs can be examined at will for brood diseases that are an ever present danger to the life of the colony. The location of every colony should be registered with the county agricultural commissioner; this is re-

quired by law in California. There is no charge for this registration, or for official inspection of colonies for brood diseases.

Suitable equipment should be secured in advance of the period of the honey flow. Every colony should have the equivalent of one hive body for the brood chamber and at least two supers for surplus honey. For the home apiary, the ideal equipment includes: two hive bodies as a brood chamber, a queen excluder, and from two to four shallow supers for surplus honey for each colony. A bee smoker, bee veil, hive tool, and bee brush are essential tools. Honey extractors are becoming increasingly difficult to obtain; but for the home apiary honey can be produced conveniently and economically in shallow frames, and used as comb honey. A queen excluder is needed when comb honey is produced in shallow frames.

Every beekeeper, whether he has one colony or a thousand, should have one or more textbooks on beekeeping and should subscribe to at least one bee journal. Textbooks and catalogues explain how to assemble equipment and how to care for bees at different seasons of the year.

Food Requirements of Bees

Bees need honey and pollen during the active season in order to rear brood, and a supply of honey for winter stores. For best results, a colony should have a surplus of at least 30 pounds of honey at all seasons when the bees are not actively gathering nectar. If they are short of honey and nectar is not available, they should be fed sugar sirup. Because of the importance of bees, sugar can be secured through the sugar-rationing boards, to feed starving colonies. It is very poor policy, however, to rob a colony too closely of its honey and then feed sirup; bees thrive better on natural stores.

The Care of the Colony

Space will not permit detailed descriptions of colony manipulations, or of bee behavior, and the reader should consult the references listed at the end of this leaflet for further information.

Wintering

A colony should be wintered in a two-story hive, with one of the hive bodies filled with honey and pollen. In California valley locations, bees do not need any additional protection from cold. It is well to contract the entrance to about 6 inches

¹Associate Professor of Entomology and Associate Apiculturist in the Experiment Station.

to conserve the hive temperature, and to place the queen excluder between the bottom board and the lower hive to keep out mice. This should be done after the bees kill their drones in the fall. The bees should not be disturbed during the winter period. They generally fly on warm days.

Spring Care

During the first or second week of deciduous-fruit bloom, the brood in each colony should be carefully examined on a warm day for disease--indicated by the presence of dead larvae in the cells. (Symptoms of bee disease are given in textbooks.) One also should note if the colony has sufficient honey and if its general condition is normal, as evidenced by the presence of eggs and worker brood in normal quantity for the time of year. If a colony is below average strength in number of bees, this may be attributed to an old or a poor queen, to the lack of sufficient stores, or to the presence of some brood disease. In all such cases, determine the cause and supply the remedy as soon as the condition is discovered.

Supering for Surplus Honey and Swarm Control

A normal colony will seldom need attention until the third or fourth week of deciduous-fruit-tree bloom, if it is wintered in a two-story hive with sufficient pollen and honey. By that time it should have from 10 to 15 frames of brood and may need additional super space to prevent swarming. If the bees are wintered in a one-story hive, the second hive body of combs should be given during the first week of bloom or when the bees have brood in six or seven combs. If colonies are kept for extracted honey, the third story of combs may be placed between the first and second as soon as the bees have filled the first two with brood, bees, and honey, and before they start building queen cells in preparation for swarming. If a colony persists in building swarm cells after the third story is added, the queen can be confined in the lower hive body 10 days or 2 weeks after the third hive body is given, and the frames of unsealed brood in the lower hive body exchanged for frames of emerging brood in the top story; this frequently forestalls further swarming preparations.

Shallow supers for comb-honey production should be given to the colony, above a queen excluder, a week or so before the main nectar flow begins. If the colony is crowded for room at that time, the queen can be placed in the lower hive body, the excluder added, then one or two shallow supers of foundation supplied, and the second hive body of brood placed above. Ten days later, any queen cells present in either brood chamber should be destroyed and the two brood chambers united, with only the supers above the queen excluder. A maximum amount of honey is produced only when the colonies are never crowded for storage space.

Hiving Swarms

A swarm can be hived on frames of foundation

or on drawn combs. A frame of brood added from another colony will be assurance that the swarm will not desert its new home. If no hive is available, any wooden box will suffice for a couple of days until a hive can be obtained, and into which the swarm should be transferred. A swarm or colony of bees can be united to another colony by placing a thickness of newspaper, perforated with a few small holes, between the hive bodies to be united. Union is best made in late afternoon.

Making Increase

Colonies should be increased in number without swarming. Increase is most efficiently made 6 to 8 weeks before the main honey flow, or just prior to swarming time in the spring. The simplest way is to use a colony that has filled a two- or three-story hive with brood, bees, and honey, and needs additional room. Move the colony a few feet from its location, with the entrance in the opposite direction. In its former location, place a bottom board and set thereon one of the hive bodies containing mostly frames of unsealed brood and adhering bees, and give it a super of combs or a shallow super of foundation over a queen excluder. This new division will contain the greater number of bees the following day, as all of the field bees will return to it from the parent colony. The queen should be left in the parent colony with most of the frames of sealed brood. While the division, or new colony, will rear a queen, it is best to introduce a queen the day after the division is made. If a colony persists in swarming, it can be divided in a similar manner and the "divide" left with a queen cell on one of its frames of brood.

Purchase or Lease of Additional Colonies

The Government has listed the care of 25 colonies of bees as the equivalent of one war-work unit; and because of the need of increased production of honey and beeswax, every person with experience in beekeeping should undertake to keep as many colonies as his time spent in other essential war work will allow. Many side-line beekeepers are now engaged in defense activities and if they cannot give their bees proper care, those who have some extra time should acquire these bees either by purchase or by lease. Other apiarists have gone into military service and their bees should be cared for during their absence. There should be no idle beekeeping equipment.

Before one takes possession of bees, either by purchase or by lease, the colonies should be inspected for brood diseases by the county apriary inspector who is connected with the office of the county agricultural commissioner.

Removing Surplus Honey

When honey is to be extracted, the combs of honey can be removed any time after the bees have sealed half of the surfaces of the combs. If comb honey is produced in shallow frames for home use, or for cut-comb honey, the frames should be left

until all the cells are sealed, although ripened honey in unsealed cells is just as good for home use. In removing honey, the hive should be smoked more than usual from the top and then the bees shaken and brushed off the combs to be removed. Frames fitted with comb foundation can be substituted for full frames of honey if additional supers are not available, and if the honey flow is continuing. If a super of honey is removed from a hive during the honey flow, a super of empty combs or foundation should be given to replace it.

Production of Cut-Comb Honey

Mention has been made of producing honey in shallow frames as a very satisfactory form when only a few colonies of bees are kept for home use and no honey extractor is available. This involves the use of thin super-comb foundation in each frame at the start of each season; and the honey is produced above a queen excluder so that the queen cannot lay in the shallow frames. The shallow frames are not wired, and the foundation is fixed in place by melted beeswax, or by the thin strip of the regular top-bar. It also requires strong colonies of bees and closer attention to swarm-prevention measures.

When the combs are filled with sealed honey, they can be removed and stored in the supers, or the honey can be cut into five sections per frame and placed on $\frac{1}{4}$ -inch-mesh wire screens over a tray. The honey from the cut cells will drain out within a day or two, after which the sections can be wrapped in paraffined paper and put away for future use. A piece of the same wire, 4 inches wide by 10 inches long, bent in the form of a "U," is useful in handling the cut pieces of comb. A thin-bladed knife, heated in boiling water, serves nicely in cutting the comb into chunks of suitable size.

Production of Beeswax

The honeybee produces beeswax from honey or sugar sirup, by means of special glands located on the underside of the abdomen. Commercial beeswax is made by melting the combs and allowing the wax to separate from the waste materials in the comb. Since beeswax is an essential war material in many industries, all pieces of comb should be saved and rendered into commercial wax. Burr combs on the edges of frames, or pieces of comb, should be saved and melted in boiling water, strained through fine wire screen, and allowed to solidify. Impurities will settle to the bottom of the liquid wax and can be scraped off after the wax has cooled. Wax production can be increased when colonies are run for extracted honey by spacing the super combs 8 to the 10-frame hive and cutting deeply with the uncapping knife at extracting time. After the cappings have drained of honey, they should be converted into beeswax. All drone combs or faulty combs should be replaced with frames of foundation, and the combs rendered.

Care of Surplus Combs

The greater wax-moth is an ever present destructive agent to combs that are not protected by bees. The wax-moth seldom destroys the combs of strong colonies; therefore it is desirable to leave surplus extracting combs on the hive until late fall, after which they should be stored in a cool, dry room and fumigated with burning sulfur or other fumigants. One or two supers of surplus combs can be left on a hive during the winter if a piece of roofing paper is placed between the combs occupied by the bees and the supers containing the surplus combs. An open space of about $\frac{1}{2}$ inch for the entire width of the hive should be left in the tar paper so that the bees can have access to the combs and thus protect them from the wax moth. Mice will readily destroy combs, so the stacks of supers in storage should be made mouse-proof.

Requeening

Since the queen is the mother of all the bees of her colony, her inheritance and mating control such colony characteristics as temper, susceptibility to diseases, color of bees, and their industriousness. The age and inheritance and mating of a queen frequently determine her productivity and the size of her colony. A colony headed by a young, prolific queen swarms less and produces more than one that is less prolific. A colony should be requeened at least every second year. Purebred bees, of Italian, Caucasian, or Carniolan races are gentler than hybrid strains; bees of cross temperament need not be tolerated in any apiary.

To requeen a colony, the old queen should first be found and killed; then the new queen can be introduced in the cage in which she arrived from the queen breeder. This is done by placing the cage sidewise between the bottom of the frames and the bottom board; or between the frames of the first and second story. The colony should not be disturbed for 10 days after the new queen has been introduced, by which time she should have started to lay. It is generally desirable to remove the worker bees that accompany the queen in the mailing cage before placing it in the hive. Directions for introducing a queen are generally printed on the back of the address card fastened to the mailing cage.

Colonies can be requeened any time of the year that a colony can be operated; but the best results are obtained if the colony is actively engaged in collecting pollen and nectar at the time of introduction.

Duration of the Nectar Flow

The length of the blooming period varies greatly with the different plants, but as a general rule it seldom lasts for more than 3 or 4 weeks in California; alfalfa and star thistle are notable exceptions. Fruit bloom seldom yields much surplus honey although in favorable seasons some sur-

plus may be obtained from the cherry, prune, and apple. Consequently the colony should not be robbed too closely of its honey unless another nectar flow is imminent. Many colonies in various parts of California have to be moved from one location to another during the year to enable the colony to secure ample supplies of honey for itself and a surplus for its keeper.

Protecting Bees from Injury

In an endeavor to protect growing crops from damage by destructive insects, the grower frequently applies poisons at a time or in a manner that kills bees and other beneficial insects. This results in a loss to the farmer, the bee-keeper, and to the community as a whole. Fruit trees should not be sprayed or dusted with insecticides when they are in full bloom, but rather before the blossoms open and after a majority of the petals have fallen. Many field crops, especially cotton and the cucurbits, can be dusted or sprayed during early evening or early morning hours, when a majority of the blossoms are closed; this will reduce the lethal effects of the poisons on nectar- and pollen-gathering insects. Poisonous dusts should be applied to tomatoes and other field crops only in the early morning or late afternoon when the air is cool and still, and in a manner to prevent the drift of poisons from the fields treated. Bee-keepers should become familiar with the insect problems and spray schedules of the communities in which their bees are located and cooperate with the growers in protecting the bees from injury.

Production per Colony

The question of how much honey and beeswax will be produced annually by a colony of bees cannot be answered satisfactorily since production will depend on such factors as weather, plant growth, available nectar and pollen sources, soil moisture, duration of the honey flow, and on how the colony is manipulated. A normal colony of bees in a good location in a favorable year may produce 60 to 100 or more pounds of honey, from 1 to 3 pounds of beeswax, and still have sufficient honey left to last until the next flow. In unfavorable locations or seasons, a colony may have to be fed sugar sirup to keep it alive.

How to Feed Bees Sugar Sirup

Colonies that do not have sufficient honey to fill their needs until nectar is available, should be fed on sugar sirup made by dissolving granulated beet or cane sugar in an equal quantity of water. The sirup can be placed in a friction-top or screw-cap container which has had the lid perforated with a number of small holes, and the container inverted over the frames of the top story. An empty hive body should be placed around the container, and the hive covered in the usual manner. If the hive is level, and the lid close fitting, the sirup will not leak out, and will be taken down and stored in the combs after the excess moisture has been removed.

General Requisites for Success

To be successful, a beekeeper should study bee behavior, become familiar with the kinds of nectar and pollen plants and their blooming periods, and know how to recognize and control bee diseases.

Sources of Information on Beekeeping

For more detailed information the reader should consult the publications given below. These and other good references are often available in public libraries.

California Agricultural Extension Circular 100. Beekeeping in California, by J. E. Eckert.
California Agricultural Experiment Station Bulletin 517. Nectar and Pollen Plants of California, by G. H. Vansell and J. E. Eckert.
ABC and XYZ of Bee Culture. Published by A. I. Root Company, Medina, Ohio.

The following are standard bee journals:

Gleanings in Bee Culture, Medina, Ohio.
The Beekeepers Item, P. O. Box 687, San Antonio, Texas.
American Bee Journal, Hamilton, Illinois.

The secretary of the California State Beekeepers Association is Thomas S. Davis, Rt. 7, Box 3914, Sacramento, California.